Serial No.: 10/634,935   Docket No. 2002-1073

CLAIMS

1   1. A method for use in a network that includes first and second network nodes

2   interconnected by multiple links, each of said links having multiple channels, said

3   method reserving channels of particular ones of said links for requested connections

4   between said first and second nodes, ones of said channels in ones of said links

5   having been previously reserved for other connections between said nodes using a

6   first link selection algorithm, the method comprising responding to requests for

7   connections between said first and second nodes by utilizing a second link selection

8   algorithm different from said first link selection algorithm to select a particular link

9   for each requested connection,

10   wherein said first algorithm is a best-fit algorithm and said second algorithm

11   is an interleave algorithm,

12   wherein there are K of said links having indices 1, 2,...,K,

13   wherein said interleave algorithm is such that said first node responds to a

14   connection request by selecting, as said particular link,

15   a) a link from among the links having the indices {1,3,5,...,M} that has

16   the smallest amount of unassigned bandwidth that can still

17   accommodate the connection request, or, if there is no such link,

18   b) the first link having an index in the sequence {N ,...6,4,2} that has

19   enough unassigned bandwidth to accommodate the connection request,

20   wherein said interleave algorithm is such that said second node responds to a

21   connection request by selecting, as said particular link,

22   a) a link from among the links having the indices {2,4,6,...,N} that has

23   the smallest amount of unassigned bandwidth that can still

24   accommodate the connection request, or, if there is no such link, ·

25   b) the first link having an index in the sequence {M ,...5,3,1} that has

26   enough unassigned bandwidth to accommodate the connection request,

27   wherein M is the largest odd number ≤ K, and

28   wherein N is the largest even number ≤ K.

2

Serial No.: 10/634,935   Docket No. 2002-1073

1   2. Canceled.

1   3. (Currently Amended) The invention of ~~claim 2~~claim 1 wherein

2   said nodes operate in a communication network in which initially provisioned

3   connections are made between pairs of endpoints,

4   restoration connections are made between at least particular pairs of said

5   endpoints upon failure of the initially provisioned connections between those

6   endpoints,

7   said ~~first~~ best-fit algorithm is used to initially provision said other

8   connections,

9   and said requested connections are ones of said restoration connections.

1   4. The invention of claim 3 wherein one of two versions of said ~~second~~

2   interleave algorithm is used when said first node receives a connection request and

3   wherein the other of said two versions of said interleave ~~second~~algorithm is used

4   when said second node receives a connection request.

1   5-6. Canceled.

1   7. (Currently Amended) The invention of ~~claim 6~~ claim 1 wherein

2   ~~there are K of said links having indices 1, 2,...,K, and~~

3   said best-fit algorithm is such as to select as a link for a requested connection

4   the lowest-indexed link from among those of said links that have the smallest amount

5   of unassigned bandwidth that can still accommodate the connection request.

1   8-9. Canceled.

1   10. (Currently Amended) The invention of ~~claim 6~~ claim 1 wherein each of

2   said nodes is a cross-connect.

1   11. (Currently Amended) A communication network node for use in a

2   communication network in which initially provisioned connections are made between

3   pairs of endpoints, and wherein restoration connections are made between at least

4   particular pairs of said endpoints upon failure of the initially provisioned connections

5   between those endpoints,

3

6   said network node being adapted to be connected to a second communications

7 network node by multiple links, each of said links having multiple channels,

8   said network node being further adapted to reserve at least one channel of a

9 particular one of said links for a requested connection between said network node and

10 said second network node using a selected one of two different link selection

11 algorithms,

12   a first one of said link selection algorithms being used when the requested

13 connection is an initially provisioned connection and a second one of said link

14 selection algorithms being used when the requested connection is a restoration

15 connection,

16   wherein said first algorithm is a best-fit algorithm and said second algorithm

17 is an interleave algorithm,

18   wherein there are K of said links having indices 1, 2,....K,

19   wherein said interleave algorithm selects said particular one of said links

20 utilizing a particular one of two versions of said interleave algorithm,

21   a first one of said versions selecting as said particular link,

22   a) a link from among the links having the indices {1,3,5,...,M}

23   that has the smallest amount of unassigned bandwidth that can

24   still accommodate the connection request, or, if there is no such

25   link,

26   b) the first link having an index in the sequence {N ,...6,4,2}

27   that has enough unassigned bandwidth to accommodate the

28   connection request,

29   and a second one of said versions selecting as said particular link,

30   a) a link from among the links having the indices {2,4,6,...N}

31   that has the smallest amount of unassigned bandwidth that can

32   still accommodate the connection request, or, if there is no such

33   link,

34   b) the first link having an index in the sequence {M ,...5,3,1}

35   that has enough unassigned bandwidth to accommodate the

36   connection request,

37 wherein M is the largest odd number $\leq K$, and

38 wherein N is the largest even number $\leq K$.

4

1   12-15. Canceled.

1   16. (Currently Amended) The invention of ~~claim 15~~claim 11 wherein

2   ~~there are K of said links having indices 1, 2,...,K, and~~

3   said best-fit algorithm is such as to select as a link for a requested connection

4   the lowest-indexed link from among those of said links that have the smallest amount

5   of unassigned bandwidth that can still accommodate the connection request.

1   17-18. Canceled.

1   19. (Currently Amended) The invention of ~~claim 18~~ claim 11 wherein said

2   network node is adapted to be programmed to use a particular one of said versions for

3   selecting links for connections between itself and said second network node.

1   20. (Original) The invention of claim 19 wherein said network node is

2   adapted to be programmed to use the other of said versions for selecting links for

3   connections between itself and a third node.

1   21. (Original) The invention of claim 19 wherein said programming includes

2   at least one of a) configuration by an operator and b) execution of a protocol wherein

3   said network node receives information from said second network node that

4   determines which of said versions said network node is to use.

1   22. (Currently Amended) The invention of claim 11~~claim 18~~ wherein said

2   network node is a cross-connect.

1   23. (Currently Amended) A method for use in a communication network of a

2   type comprising a plurality of cross-connects, individual pairs of said cross-connects

3   being interconnected by multiple links, each of said links having multiple channels,

4   the method comprising

5   provisioning an initial path through said network between endpoints served by

6   said network by provisioning connections between pairs of said cross-connects along

7   said initial path, each of said connections comprising particular channels of particular

8   links interconnecting said pairs of cross-connects, said initial connections being

5

9   established using a best-fit algorithm to select the links for the connections along said

10   initial path, and

11   responsive to a failure of at least one of said paths, establishing a restoration

12   path through said network between the failed path's endpoints by establishing

13   restoration connections between pairs of said cross-connects along said restoration

14   path, each of said restoration connections comprising particular channels of particular

15   links interconnecting the pairs of cross-connects along said restoration path, said

16   restoration connections being established using an interleave algorithm to select the

17   links for the connections along the restoration path,

18   wherein there are K of said links having indices 1, 2,...,K,

19   wherein said interleave algorithm is such that a first cross-connect of said

20   particular pair of cross-connects responds to each request to establish a restoration

21   connection between itself and the other cross-connect of said particular pair of cross-

22   connects by selecting for that restoration connection

23   a) a link from among the links having the indices {1,3,5,...,M} that has

24   the smallest amount of unassigned bandwidth that can still

25   accommodate the connection request, or, if there is no such link,

26   b) the first link having an index in the sequence {N ,...6,4,2} that has

27   enough unassigned bandwidth to accommodate the connection request,

28   wherein said interleave algorithm is such that a second cross-connect of said

29   particular pair of cross-connects responds to each request to establish a restoration

30   connection between itself and the other cross-connect of said particular pair of cross-

31   connects by selecting for that restoration connection

32   a) a link from among the links having the indices {2,4,6,...,N} that has

33   the smallest amount of unassigned bandwidth that can still

34   accommodate the connection request, or, if there is no such link,

35   b) the first link having an index in the sequence {M ,...5,3,1} that has

36   enough unassigned bandwidth to accommodate the connection request,

37   wherein M is the largest odd number ≤ K, and

38   wherein N is the largest even number ≤ K..

1   24. (Currently Amended) The invention of claim 23 wherein

2   ~~there are K of said links having indices 1, 2,...,K, and~~

6

Serial No.: 10/634,935   Docket No. 2002-1073

3   said best-fit algorithm is such as to select as a link for a connection between a

4   pair of said cross-connects the lowest-indexed link from among those of the links

5   interconnecting that pair of cross-connects that have the smallest amount of

6   unassigned bandwidth that can still accommodate the connection request.

25-26. Canceled.

7